UNDERGRADUATE THESIS

BLOCKCHAIN AND SMART CONTRACT BASED CROWDFUNDING APPLICATION USING ETHEREUM LAYER 2

YUDHISTIRA NANDA KUMALA
NPM 22081010055

THESIS ADVISORS
Dr. Rizky Parlika, S.Kom., M.Kom.
Hendra Maulana, S.Kom., M.Kom.

MINISTRY OF HIGHER EDUCATION, SCIENCE, AND TECHNOLOGY
UNIVERSITAS PEMBANGUNAN NASIONAL VETERAN JAWA TIMUR
FACULTY OF COMPUTER SCIENCE
INFORMATICS STUDY PROGRAM
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APPROVAL SHEET

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By:
YUDHISTIRA NANDA KUMALA
NPM. 22081010055

Has been defended before, and accepted by, the Board of Assessors of the Thesis Examination of the Informatics Study Program, Faculty of Computer Science, Universitas Pembangunan Nasional Veteran Jawa Timur, on May 12, 2026.

Approved,

Dr. Rizky Parlika, S.Kom., M.Kom. NIP. 19840518 202121 1 003	.....	**(Advisor I)**
Hendra Maulana, S.Kom., M.Kom. NIP. 19831223 202521 1 040	.....	**(Advisor II)**
Fetty Tri Anggraeny, S.Kom., M.Kom. NIP. 19820211 202121 2 005	.....	**(Head Assessor)**
Budi Mukhamad Mulyo, S.Kom., M.T. NIP. 19891118 202406 1 003	.....	**(Assessor I)**

Acknowledge by,

Dean of the Faculty of Computer Science

Prof. Dr. Ir. Novirina Hendrasarie, M.T.
NIP. 19681126 199403 2 001

APPROVAL SHEET

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By:
YUDHISTIRA NANDA KUMALA
NPM. 22081010055

Approved to proceed to the Thesis Examination

Approved by,

Coordinator of Informatics Study Program

Faculty of Computer Science

Dr. Intan Yuniar Purbasari, S.Kom., MSc.

NIP. 19800602 202521 2 029

STATEMENT OF ORIGINALITY

I am the undersigned:

Student Name	: Yudhistira Nanda Kumala
NPM	: 22081010055
Degree Program	: Bachelor (S1)
Study Program	: Informatics
Faculty	: Faculty of Computer Science

Hereby declares that this undergraduate thesis contains no part of any other scientific work that has been submitted to obtain an academic degree at any higher education institution. Furthermore, it does not contain any work or opinions previously written or published by others, except for those which are explicitly cited in this thesis and listed completely in references.

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Surabaya, May 22, 2026

Declarent,

YUDHISTIRA NANDA KUMALA

NPM. 22081010055

ABSTRACT

Student Name / NPM	:	Yudhistira Nanda Kumala / 22081010055
Thesis Title	:	Blockchain and Smart Contract Based Crowdfunding Application Using Ethereum Layer 2
Advisors	:	1. Dr. Rizky Parlika, S.Kom., M.Kom. 2. Hendra Maulana, S.Kom., M.Kom.

Conventional crowdfunding systems currently face challenges such as data centralization, the risk of fund misuse, and high operational costs, which result in limited transparency and accountability in public fund management. Although blockchain technology and smart contracts are capable of providing transparent and publicly auditable funding mechanisms, direct implementation on the Ethereum Layer 1 network faces efficiency hurdles due to high transaction costs (gas fees). This research aims to design and implement a crowdfunding application named OpenFund that utilizes Ethereum Layer 2 technology, specifically the Base Sepolia network based on Optimistic Rollup, as a solution to reduce transaction costs without compromising data security and transparency. The study was conducted through an empirical comparative analysis between the Ethereum Sepolia (Layer 1) and Base Sepolia (Layer 2) networks.

The testing phase encompasses system functionality verification using Black Box Testing methods and transaction cost (gas fee) testing of the crowdfunding application's core smart contract functions. Testing results indicate that the OpenFund application successfully executed the entire operational cycle stably. Based on the testing results, it was found that gas fees on the Base Sepolia network (Layer 2) were consistently lower than those on Ethereum Sepolia (Layer 1). An average efficiency range of 99.61% to 99.77% was derived from the comparison of transaction cost data across multiple tests conducted at different times. Nevertheless, these values represent averages of data obtained within a testnet environment and do not reflect identical averages in a mainnet environment. Therefore, these results are interpreted as an indication of relative efficiency trends rather than fixed outcomes applicable to all network environments.

Keywords: Blockchain, Smart Contract, Crowdfunding, Ethereum, Layer 2, Base.

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The author realizes that in the preparation of the following thesis there are many shortcomings. For this reason, constructive criticism and suggestions from all parties are highly expected for the perfection of writing the following thesis.

Surabaya, May 22th 2026

Author

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